



CASE REPORT

Endodontic treatment of an invaginated maxillary lateral incisor with a periradicular lesion and a healthy pulp

T. Tsurumachi

Division of Advanced Dental Treatment, Department of Endodontics, Nihon University School of Dentistry, Tokyo, Japan

Abstract

Tsurumachi T. Endodontic treatment of an invaginated maxillary lateral incisor with a periradicular lesion and a healthy pulp. *International Endodontic Journal*, **37**, 717–723, 2004.

Aim To report the healing of a periradicular lesion following nonsurgical root canal treatment of a dental invagination.

Summary A case of dens invaginatus type 3 with a periradicular lesion and a healthy pulp is reported. Nonsurgical root canal treatment of the invagination was performed successfully and resolved an associated periradicular lesion. Despite the complex anatomy and a diagnosis of apical periodontitis, pulp health was retained after endodontic treatment of the invaginated canal. Clinical considerations and treatment are discussed and reported.

Key learning points

- Dens invaginatus can present in a variety of forms, knowledge of which can usefully inform endodontic diagnosis and treatment.
- In certain cases, success can be achieved by treating the invagination alone.
- Pulp health may be preserved during and after treatment of an infected invagination.

Keywords: dens invaginatus, maxillary lateral incisor, periradicular lesion, root canal treatment, vital pulp.

Received 1 December 2003; accepted 3 June 2004

Introduction

Dens invaginatus is a developmental malformation resulting from invagination of the tooth crown or root before calcification has occurred. The aetiology of this phenomenon has been related either to focal growth retardation, focal growth stimulation, or to localized external pressure in certain areas of the tooth bud (Shafer *et al.* 1983). Dens invaginatus

Correspondence: Dr Tamotsu Tsurumachi, Department of Endodontics, Nihon University School of Dentistry, 1-8-13, Kanda-Surugadai, Chiyoda-ku, Tokyo 101-8310, Japan (Tel.: 81-3-3219-8142; fax: 81-3-3219-8348; e-mail: tsurumachi@dent.nihon-u.ac.jp).

may occur in any deciduous or permanent tooth, but it is most common in the permanent maxillary lateral incisor (Bimstein & Shteyer 1976). The extent of invagination varies: it may be confined to crown alone, merely as a coronal pit, or extended into the radicular structure to various levels. Different classifications have been suggested to describe this malformation (Hallet 1953, Ulmansky & Hermel 1964, Vincent-Townend 1974). Oehlers (1957) classified dens invaginatus into three types: type 1: an enamel minor form within the crown of the tooth and not extending beyond the cemento-enamel junction; type 2: an enamel-lined form which invades the root as a blind sac and may communicate with the pulp; type 3: a severe form which extends through the root and opens in the apical region without communication with the pulp. The complex anatomy of dens invaginatus makes their root canal treatment difficult. Various techniques for treating dens invaginatus have been reported, including nonsurgical endodontic treatment (Girsch & McClammy 2002), endodontic surgery (Sauveur *et al.* 1997), and intentional replantation (Lindner *et al.* 1995). Early diagnosis and treatment of dens invaginatus is important in preventing pulp infection via the invagination. When no communication exists between the invagination and the pulp cavity, nonsurgical endodontic treatment has proved successful by treating the invagination as a separate entity and preserving the vitality of the pulp. Several case reports have described successful endodontic treatment of periapical lesions in maxillary incisors with dens invaginatus type 3. In both cases the invaginated area was necrotic whereas the pulp in the main canal remained healthy (Szajkis & Kaufman 1993, Schwartz & Schindler 1996).

The purpose of this article is to report a dens invaginatus case involving a maxillary lateral incisor in which only the invagination was treated. Nonsurgical root canal treatment of the invagination retained pulp health and resulted in resolution of a substantial periradicular lesion.

Case report

A 10-year-old boy with a noncontributory medical history was referred for endodontic treatment of tooth 12 (FDI). The dental history revealed traumatic injury to the maxillary lateral incisor as a result of a playing basketball 3 months previously. Soon after the accident the patient had received a 4-day course of antibiotics from a physician. Two days after the accident, the referring practitioner started root canal treatment, but could not find the main root canal.

At the time of the first visit, the patient was asymptomatic (Fig. 1). Clinical examination revealed a peg-shaped crown (Fig. 2), with slight tenderness in the apical area. Tooth 12



Figure 1 Preoperative clinical photograph 3 months after trauma.



Figure 2 Preoperative view of maxillary lateral incisor showing a peg-shaped crown.

and its neighbouring teeth responded positively within normal limits to electric pulp sensitivity testing. Gingival probing depths were within normal limits. A periapical radiograph demonstrated dens invaginatus, and a radiolucent lesion on the mesial aspect of the apical third of the root (Fig. 3). A clinical diagnosis was established of dens invaginatus Oehlers type 3 (1957) and chronic apical periodontitis. Following isolation of the tooth with a rubber dam, the temporary filling was removed and the access cavity was completed. After careful inspection the invagination orifice was detected in a more mesial position. A file was inserted into the invaginated canal and a length-measuring radiograph was taken (Fig. 4). There did not appear to be any communication between the main root canal and the invaginated canal. The invaginated canal was debrided thoroughly and prepared by the step-back technique to apical size 40. Copious irrigation with 2.6% sodium hypochlorite solution was used throughout the procedure. This invaginated canal may have been lined with an enamel-like structure, which appeared to be harder than

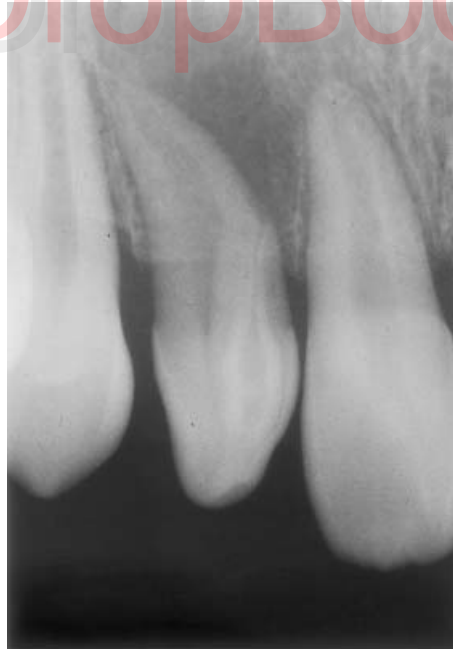


Figure 3 Preoperative radiograph of maxillary lateral incisor showing dens invaginatus with periradicular radiolucency.



Figure 4 Length determination radiograph. K-file placed in the invaginated canal.

dentine. After drying the invaginated canal with paper points, a cotton pellet was placed in the pulp chamber and the tooth was temporarily sealed with Cavit (ESPE, Seefeld, Germany). Three weeks later, the patient returned without symptoms. The invaginated canal was obturated by lateral condensation of gutta-percha and zinc oxide-eugenol sealer (Canals; Showa Yakuhin, Tokyo, Japan). The access opening was then sealed with a temporary filling and a postoperative radiograph taken (Fig. 5). The patient returned after 3 months without any symptoms, and the temporary filling was replaced by a composite filling using the acid-etch technique. Follow-up radiographs at 2 years (Fig. 6) and 5 years (Fig. 7) revealed the absence of a periradicular lesion, and the patient has remained asymptomatic.

Discussion

Dens invaginatus is undoubtedly an endodontic challenge, especially because of the complicated morphology and complex of associated root canals. The present case was an example of type 3 dens invaginatus as described by Oehlers (1957). In this type of dens invaginatus, the invagination penetrates the entire root, usually without communication with the pulp. The presence of communication between the invagination and the pulp may be of important prognostic value, but in the present case it was presumed that such communicating channels did not exist. Clinical exploration during treatment of the invaginated canal corroborated this assumption. The infected contents of this canal were removed to the working length. No bleeding occurred, and only thin shreds of a greyish material were found. Therefore, it would appear that the aetiology of the periradicular pathosis was the infected invagination. It is possible that the high pressure from the traumatic injury 3 months previously had caused necrosis of invaginated tissue of the maxillary lateral incisor or some other host/parasite imbalance, resulting in associated periradicular lesion. However, this does not explain why only the invagination became



Figure 5 Radiograph immediately after obturation of invaginated canal.



Figure 6 Two-year follow-up radiograph of maxillary lateral incisor. Radiograph reveals complete bone repair.

infected. In certain cases, following eruption, teeth with dens invaginatus lose blood supply to the tissues in the invaginated space that subsequently results in necrosis of the invaginated tissue (Schwartz & Schindler 1996). Prior to referral, the patient had received emergency treatment including partial endodontic treatment, root canal treatment being



Figure 7 Five-year follow-up radiograph of maxillary lateral incisor.

initiated. In such cases when endodontic treatment is indicated, a careful analysis of the configuration of the root canal system is an essential part of the treatment planning process. Dens invaginatus may be recognized radiographically before treatment (Gotoh *et al.* 1979). A detailed radiographical examination is therefore essential if the malformation is suspected. Correct diagnosis may depend on the diagnostic quality of the film, but is more influenced by the practitioner's knowledge and experience. In addition, it is advisable to carry out pulp sensitivity testing to provide a better understanding of the pulp condition of such teeth. In cases of dens invaginatus evidence of pulp vitality does not necessarily mean that the whole pulp is healthy. It sometimes happens that the invagination is necrotic and the main pulp canal remains intact (Ikeda *et al.* 1995). In cases where pulpal involvement has not been detected, endodontic treatment of the invaginated canal has been recommended to maintain pulp health within the major canal. Szajkis & Kaufman (1993) and Schwartz & Schindler (1996) reported a dens invaginatus type 3 case in which only the invagination was treated and resulted in resolution of the periapical lesion.

In this case, endodontic treatment of only the invaginated canal resulted in resolution of the periradicular lesion. The health of the pulp of the main root canal was maintained after the root canal treatment.

Conclusion

Orthograde root canal treatment of the invaginated canal proved successful in promoting healing of an associated periradicular lesion and maintained the health of the pulp tissue in the major canal.

Disclaimer

Whilst this article has been subjected to Editorial review, the opinions expressed, unless specifically indicated, are those of the author. The views expressed do not necessarily

represent best practice, or the views of the IEJ Editorial Board, or of its affiliated Specialist Societies.

References

- Bimstein E, Shteyer A (1976) Dilated type of dens invaginatus in the permanent dentition: report of a case and review of the literature. *Journal of Dentistry for Children* **43**, 410–3.
- Girsch WJ, McClammy TV (2002) Microscopic removal of dens invaginatus. *Journal of Endodontics* **28**, 336–9.
- Gotoh T, Kawahara K, Imai K, Kishi K, Fujiki Y (1979) Clinical and radiographic study of dens invaginatus. *Oral Surgery, Oral Medicine and Oral Pathology* **48**, 88–91.
- Hallet GE (1953) The incidence, nature and clinical significance of palatal invagination in the maxillary incisors teeth. *Proceedings of the Royal Society of Medicine* **46**, 491–9.
- Ikeda H, Yoshioka T, Suda H (1995) Importance of clinical examination and diagnosis; a report of dens invaginatus. *Oral Surgery, Oral Medicine and Oral Pathology* **79**, 88–91.
- Lindner C, Messer HH, Tyas MJ (1995) A complex treatment of dens invaginatus. *Endodontics and Dental Traumatology* **11**, 153–5.
- Oehlers FAC (1957) Dens invaginatus (dilated composite odontome). 1. Variations of the invagination process and associated anterior crown forms. *Oral Surgery, Oral Medicine and Oral Pathology* **10**, 1204–18.
- Sauveur G, Roth F, Sobel M, Boucher Y (1997) Surgical treatment of a periradicular lesion on an invaginated maxillary lateral incisor (dens in dente). *International Endodontic Journal* **30**, 145–9.
- Schwartz SA, Schindler WG (1996) Management of a maxillary canine with dens invaginatus and a vital pulp. *Journal of Endodontics* **22**, 493–6.
- Shafer WG, Hine MK, Levy BM (1983) Developmental disturbances of oral and paraoral structures. In: *A Textbook of Oral Pathology*, 4th edn. Philadelphia, USA: W.B. Saunders Co., pp. 2–58.
- Szajkis S, Kaufman AY (1993) Root invagination treatment: a conservative approach in endodontics. *Journal of Endodontics* **19**, 576–8.
- Ulmansky M, Hermel J (1964) Double dens in dente in a single tooth. *Oral Surgery, Oral Medicine and Oral Pathology* **17**, 92–7.
- Vincent-Townend J (1974) Dens invaginatus. *Journal of Dentistry* **2**, 234–8.